# The Alaska Native Traditional Food Safety Monitoring Program

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# Alaska Native Traditional Food Safety Monitoring Program

- Background
  - Alaska Native Demographics
  - Alaska Native Diet
  - Climate Change in Alaska
  - Alaska Native Maternal/Infant Health Status
- Circumpolar Contaminant Issues
- Methods
- Preliminary Results

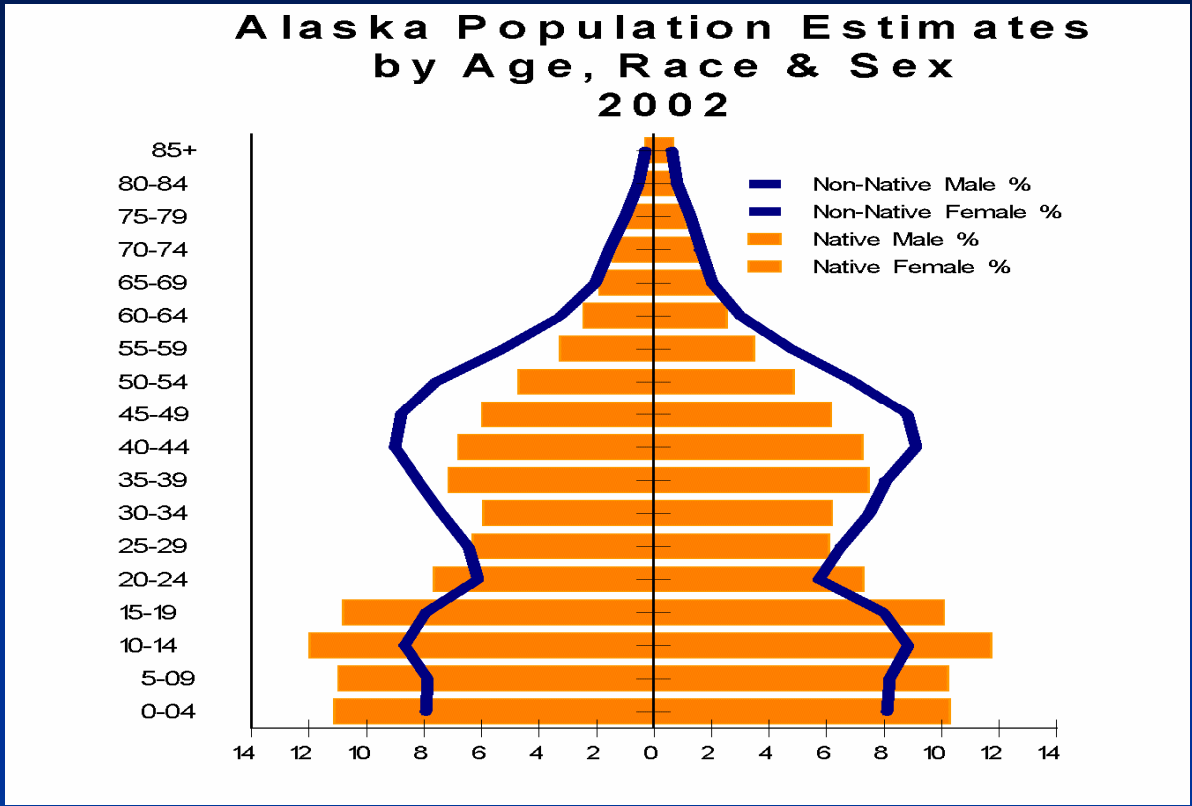
# Alaska Native Traditional Food Safety Monitoring Program

## Background

- Alaska Native population is 125,000, 19% of Alaska's population the highest Native American population percentage of any State
- Approximately 65% rural, 35% urban, 58% in villages of 200 or less
- Most of the rural communities have no road connection with major population centers

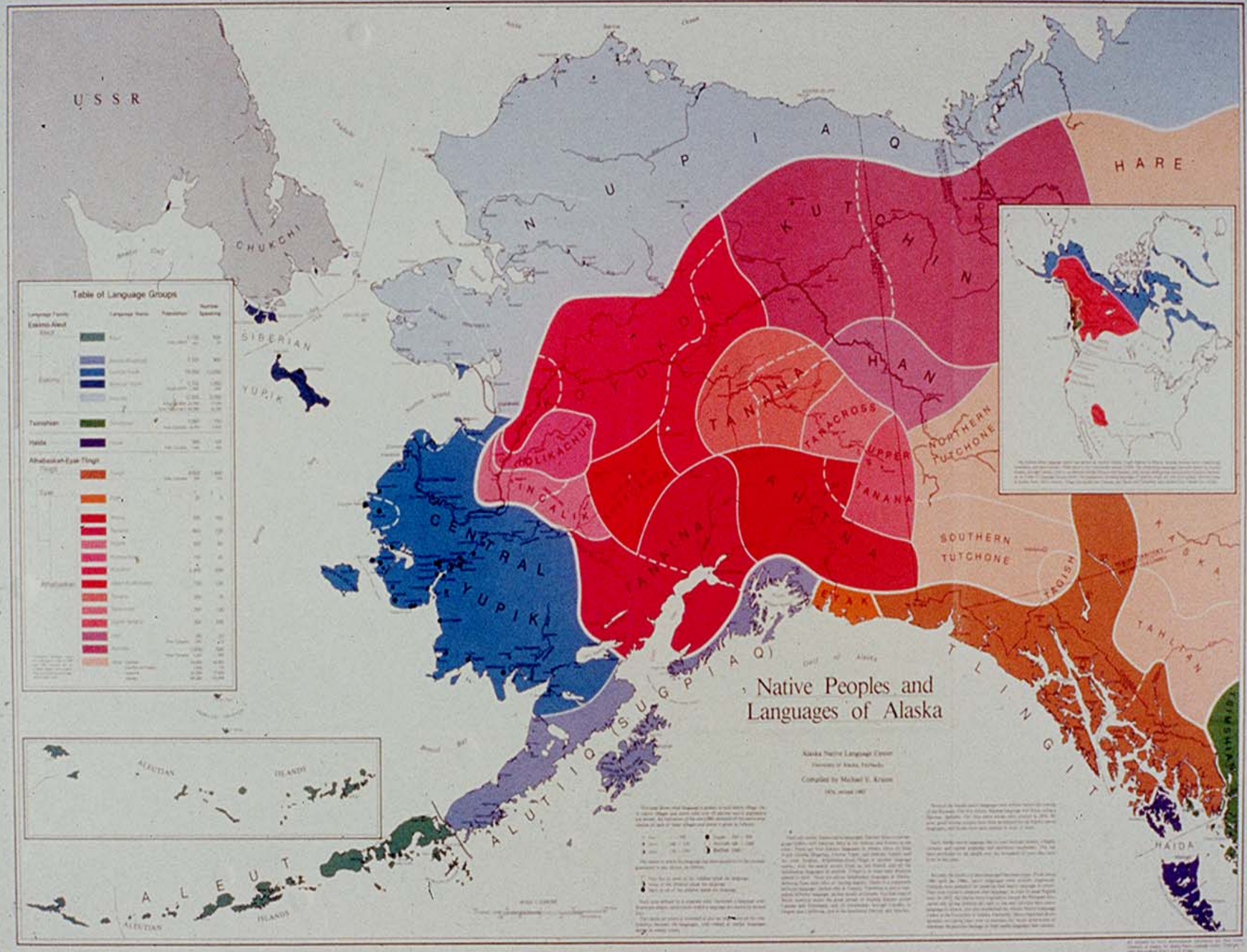
# ALASKA NATIVE HEALTH STATUS

## Alaska Population Estimates, 2002



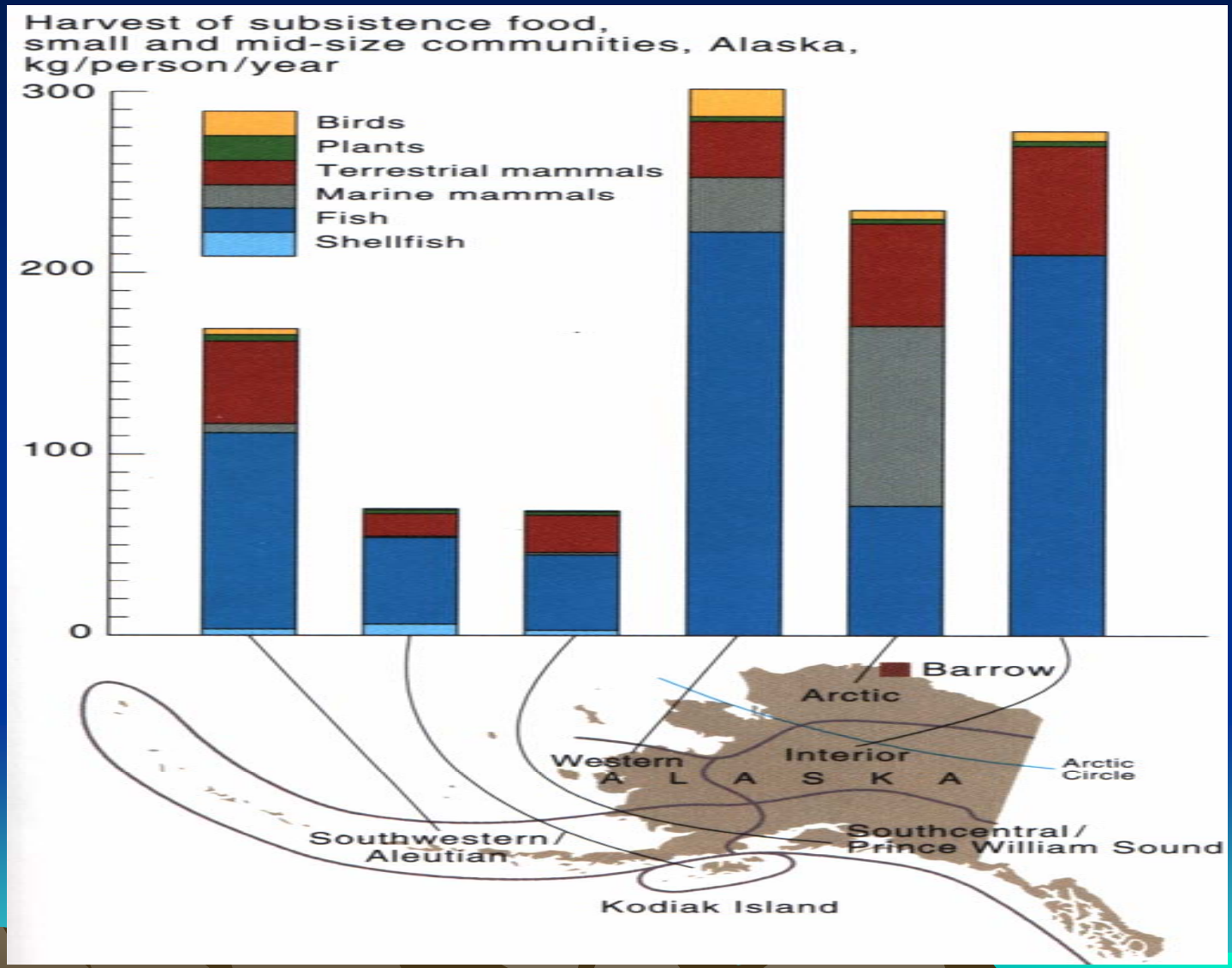

**NOTE: American Indian/Alaska Native alone or in combination with one or more of the other five races.**

**SOURCE: State of Alaska, Alaska Department of Labor & Workforce Development, Research and Analysis, Census & Geographic Information Network and U.S. Census Bureau, 2000 Census of Population & Housing Summary.**


USSR
CHUKCHI
SIBERIAN YUPIK
NUPIAQ
KUTCHIN
HARE
HAN
TANANA
TANACROSS
UPPER TANANA
NORTHERN TUTCHONE
SOUTHERN TUTCHONE
TAGISH
TAHLTAN
TLINGIT
HAIDA
TSIMSHIAN
HOLIKACHUK
INGALIK
CENTRAL YUPIK
ALUTIIQ (SUGPIAQ)
ALEUT
ALEUTIAN ISLANDS
Table of Language Groups
Native Peoples and Languages of Alaska
Alaska Native Language Center
Compiled by Michael E. Krauss

# Coastal Alaska Village

# Alaska Subsistence Food Harvest



# Alaska Native Traditional Food Safety Monitoring Program

## Subsistence Food Safety

- Rural Alaska Natives are the most subsistence dependent population in the US
- Accumulation of organic contaminants in the food web biomagnifies; the developing fetus and pregnant women are most sensitive
- Transport of contaminants by ocean, river, and atmospheric mechanisms may be increased by a warming climate

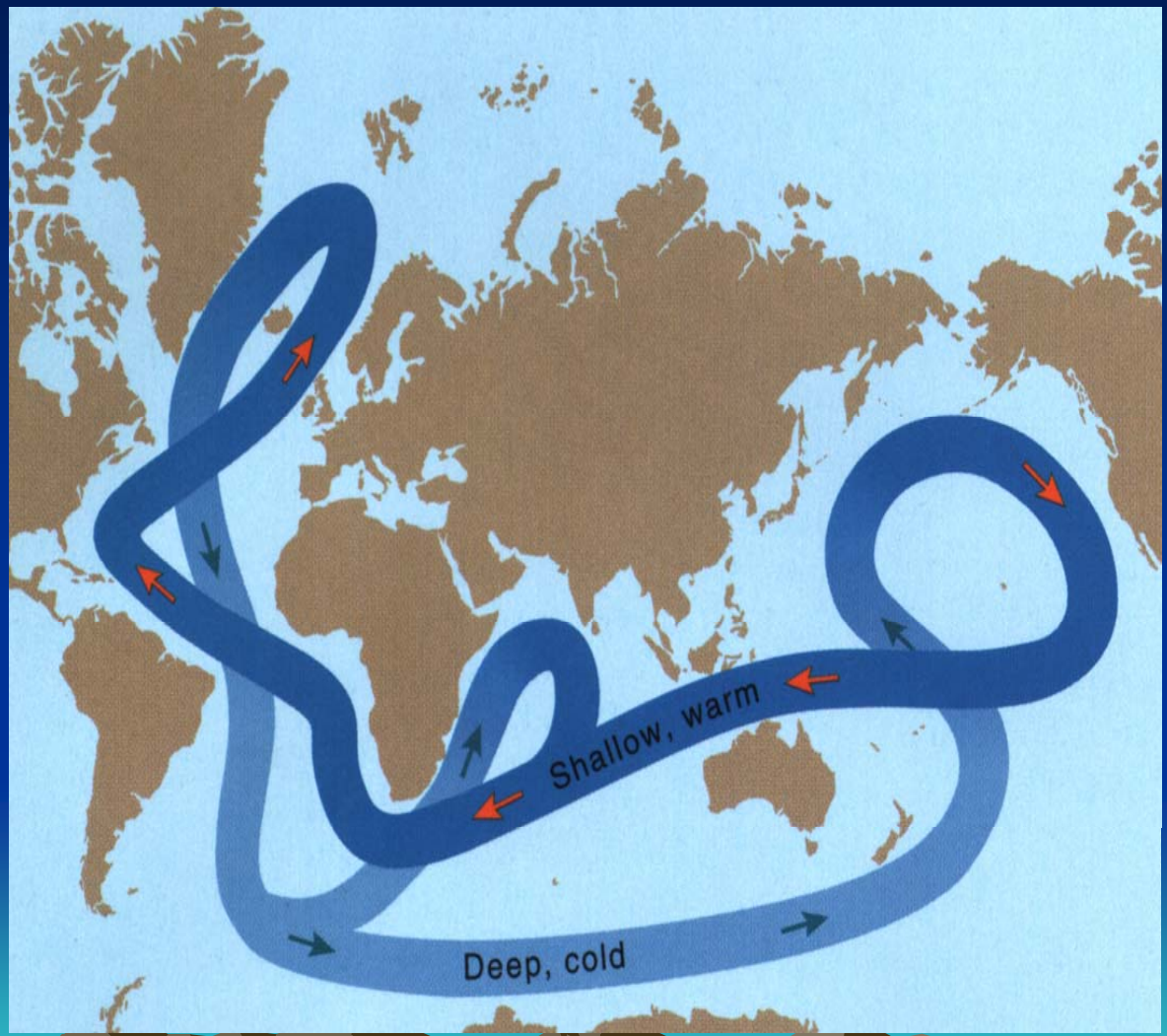
# Alaska Native Traditional Food Safety Monitoring Program

## Circumpolar Contaminant Issues

Transport of Contaminants

- Global air currents are hemispheric
- Ocean currents are global
- All local sources are eventually distributed globally

# Arctic Influence on Ocean Circulation



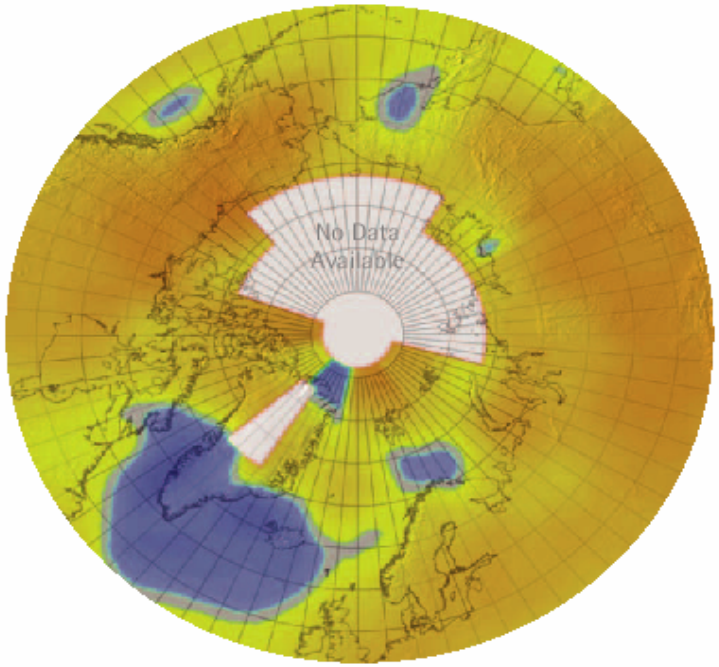

The Arctic plays a fundamental role in circulation of water in the oceans of the world. When warm, salty North Atlantic water reaches the cold Arctic around Greenland and Iceland and in the Labrador Sea, it becomes denser as it cools, and therefore sinks to deeper layers of the ocean. This process of forming deep water is slow, but takes place over a huge area. Every winter, several million cubic kilometers of water sink to deeper layers, which move water slowly south along the bottom of the Atlantic Ocean.

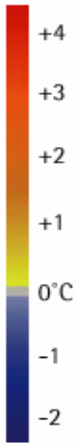
The polar front influences global ocean currents

# IMPACTS OF A WARMING ARCTIC

1 Arctic climate is now warming rapidly and much larger changes are projected.

Observed Surface Air Temperature Changes: 1954–2003
(ANNUAL, ˚C)

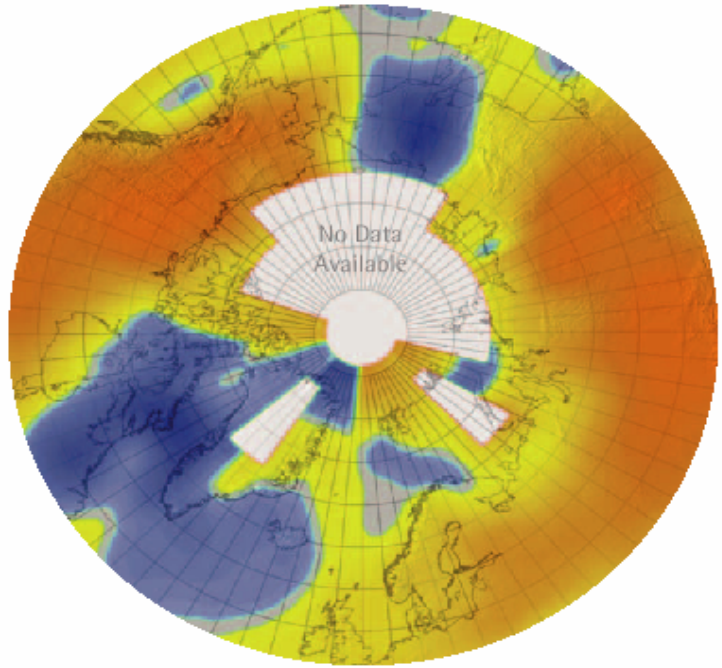





The colors indicate the change in temperature from 1954 to 2003. The map indicates annual average temperature change, which ranges from a 2-3˚C warming in Alaska and Siberia to a cooling of up to 1˚C in southern Greenland.

Observed Surface Air Temperature Changes: 1954–2003
(WINTER: Dec-Feb in ˚C)






This map indicates the temperature change during the winter months, ranging from a warming of up to 4˚C in Siberia and Northwest Canada to a cooling of 1˚C over southern Greenland.

# Alaska Native Traditional Food Safety Monitoring Program

## Circumpolar Contaminant Issues

Persistent Organic Pollutants

- Highly persistent, fat soluble, easily transportable
- Industrial origin – PCBs, PBFRs
- Agricultural pesticides – DDT, Toxaphene, Mirex, HCCH
- Industrial by-products – Dioxans, Furans, HCB

# Alaska Native Traditional Food Safety Monitoring Program

## Circumpolar Contaminant Issues

Heavy Metals

- Hg, Pb, As, Cd
- All are naturally occurring, easily transported
- Hg, As, Cd exist in forms that vary greatly in toxic potential

# Alaska Native Traditional Food Safety Monitoring Program

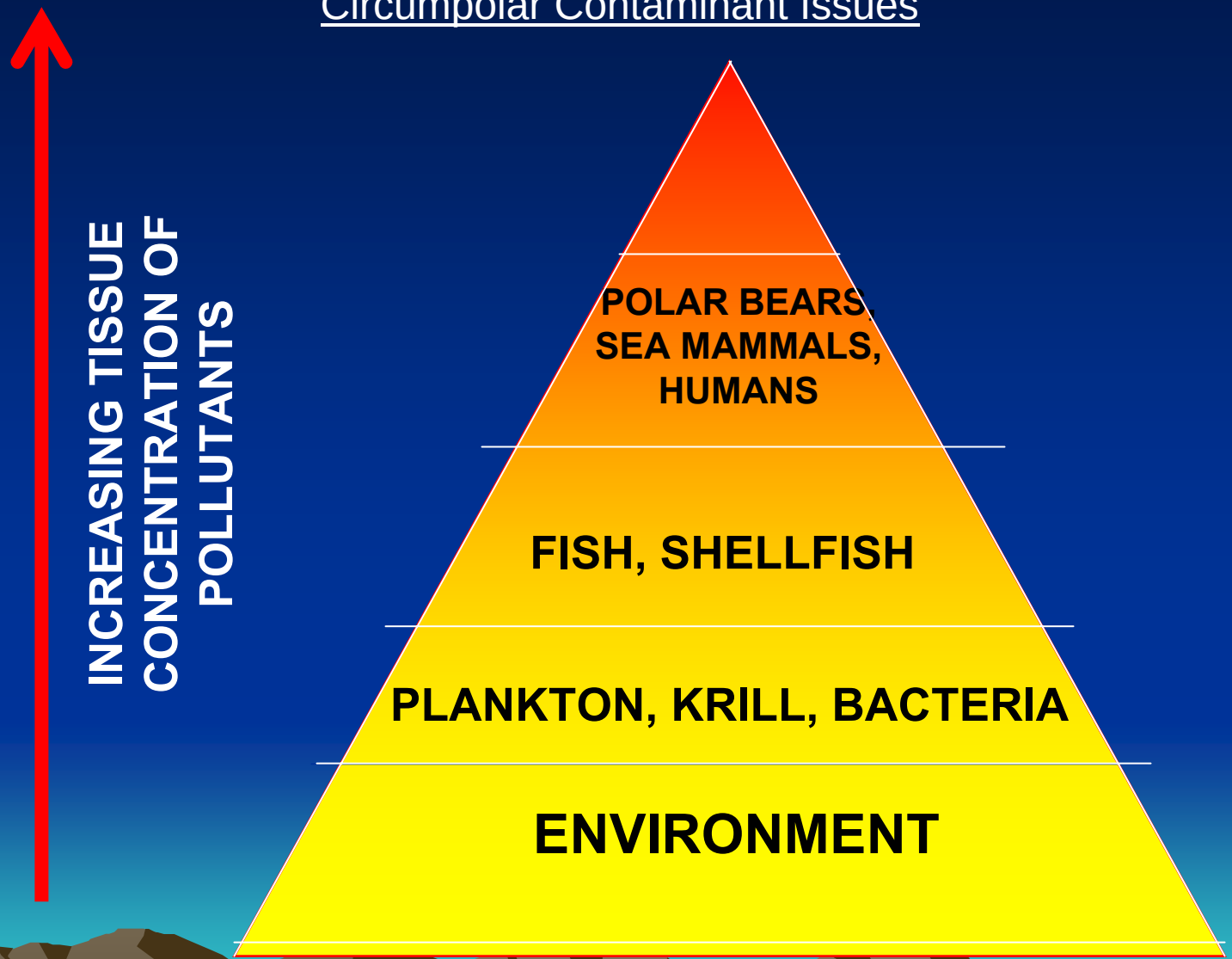
## Circumpolar Contaminant Issues

Exposure Routes

- Food chain exposure, low level, chronic
- Most sources are distant, some local
- Atmospheric transport, ocean/river transport
- Wildlife transport

# Alaska Native Traditional Food Safety Monitoring Program

## Circumpolar Contaminant Issues



# Alaska Native Traditional Food Safety Monitoring Program

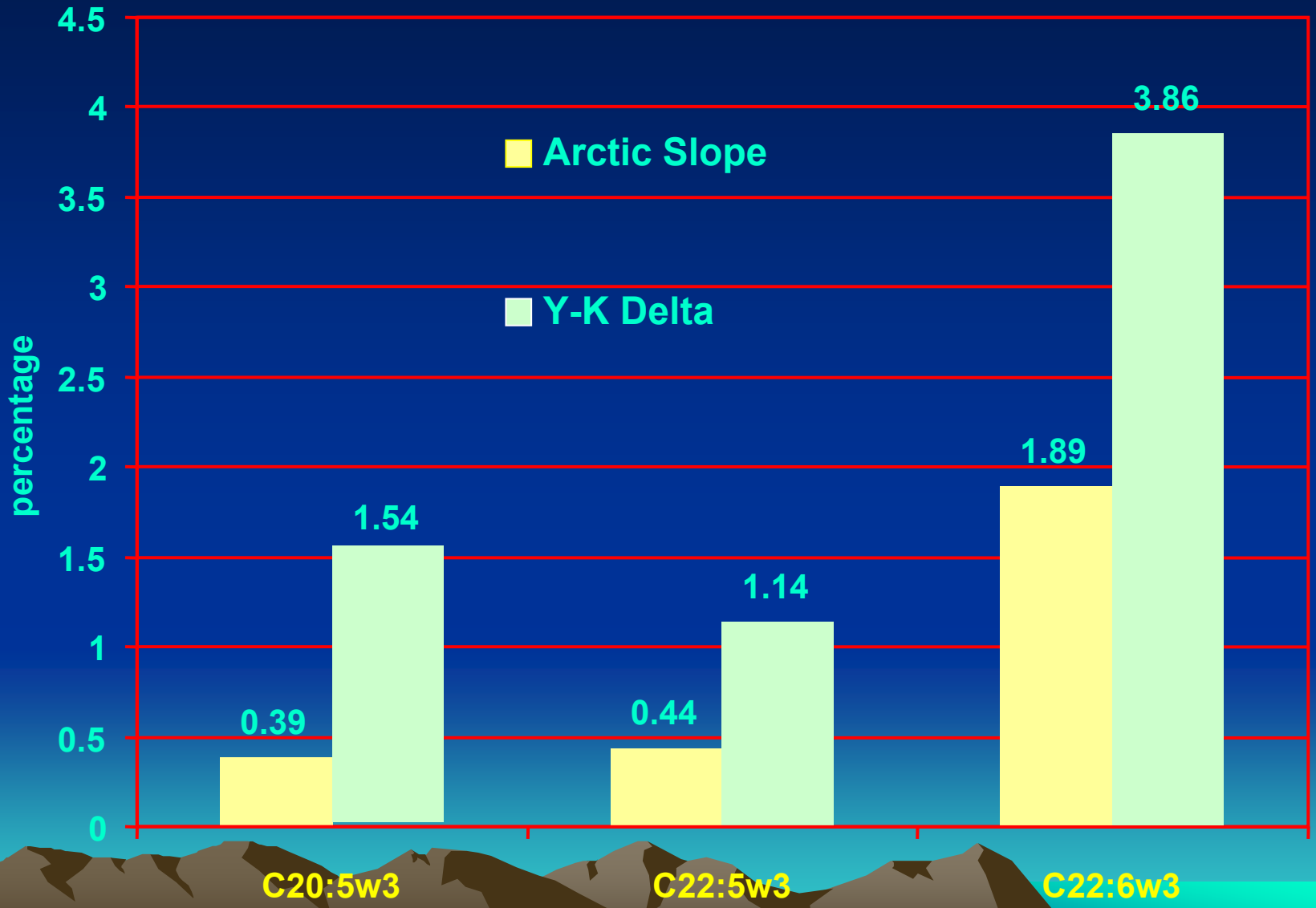
## Circumpolar Contaminant Issues

Exposure route, effects

- Maternal exposure route - diet
- Fetal exposure route - transplacental
- Newborn exposure route - breast milk
- Potential adverse effects in newborns from exposure to POPs, Lead, Mercury, Cadmiun
  - Growth
  - Neurological (cognitive impairment)
  - Immunological (infections)
- Traditional food has public health and cultural benefits

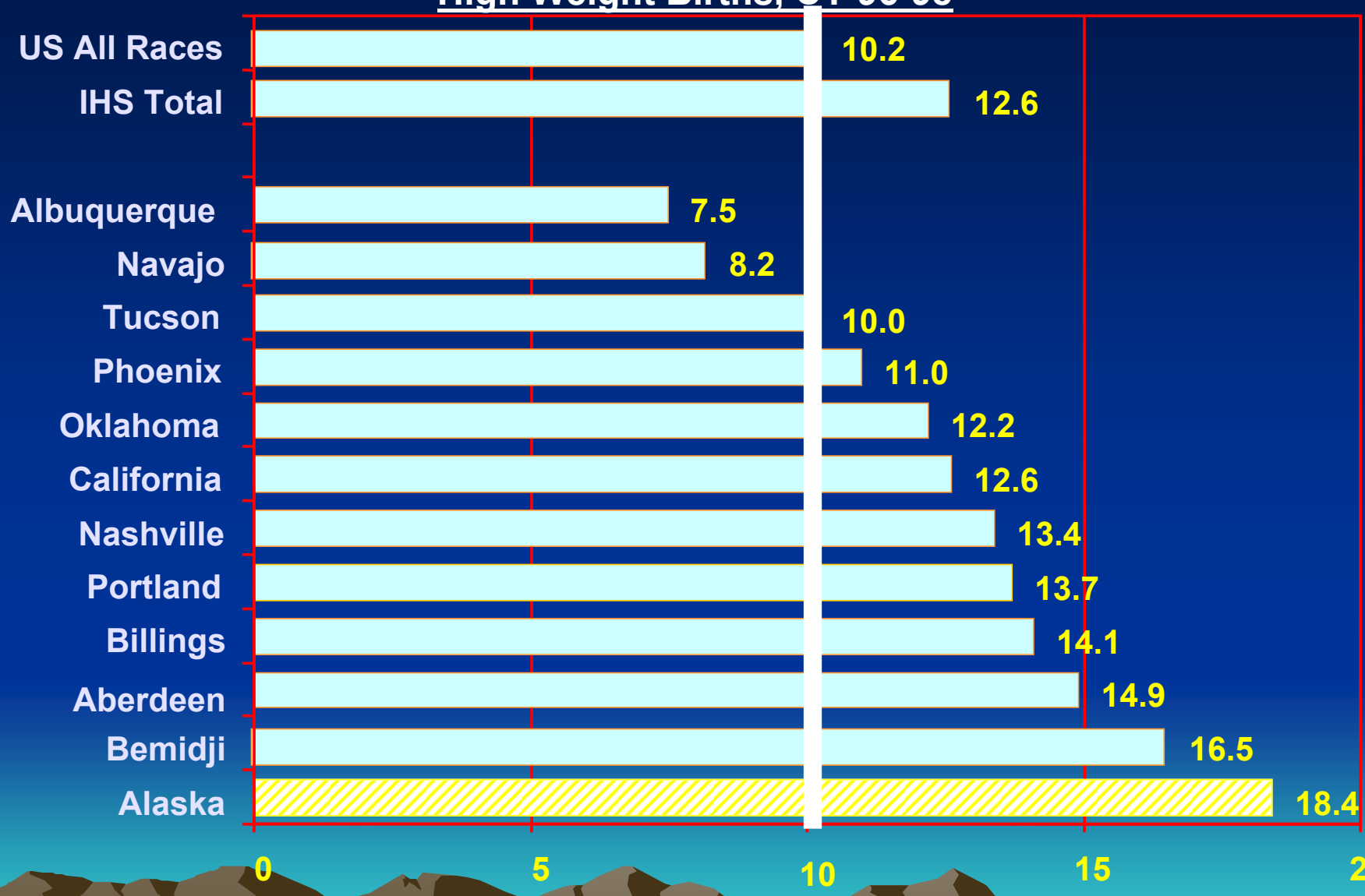
# Alaska Native Traditional Food Safety Monitoring Program

## Essential Fatty Acids Mean Values



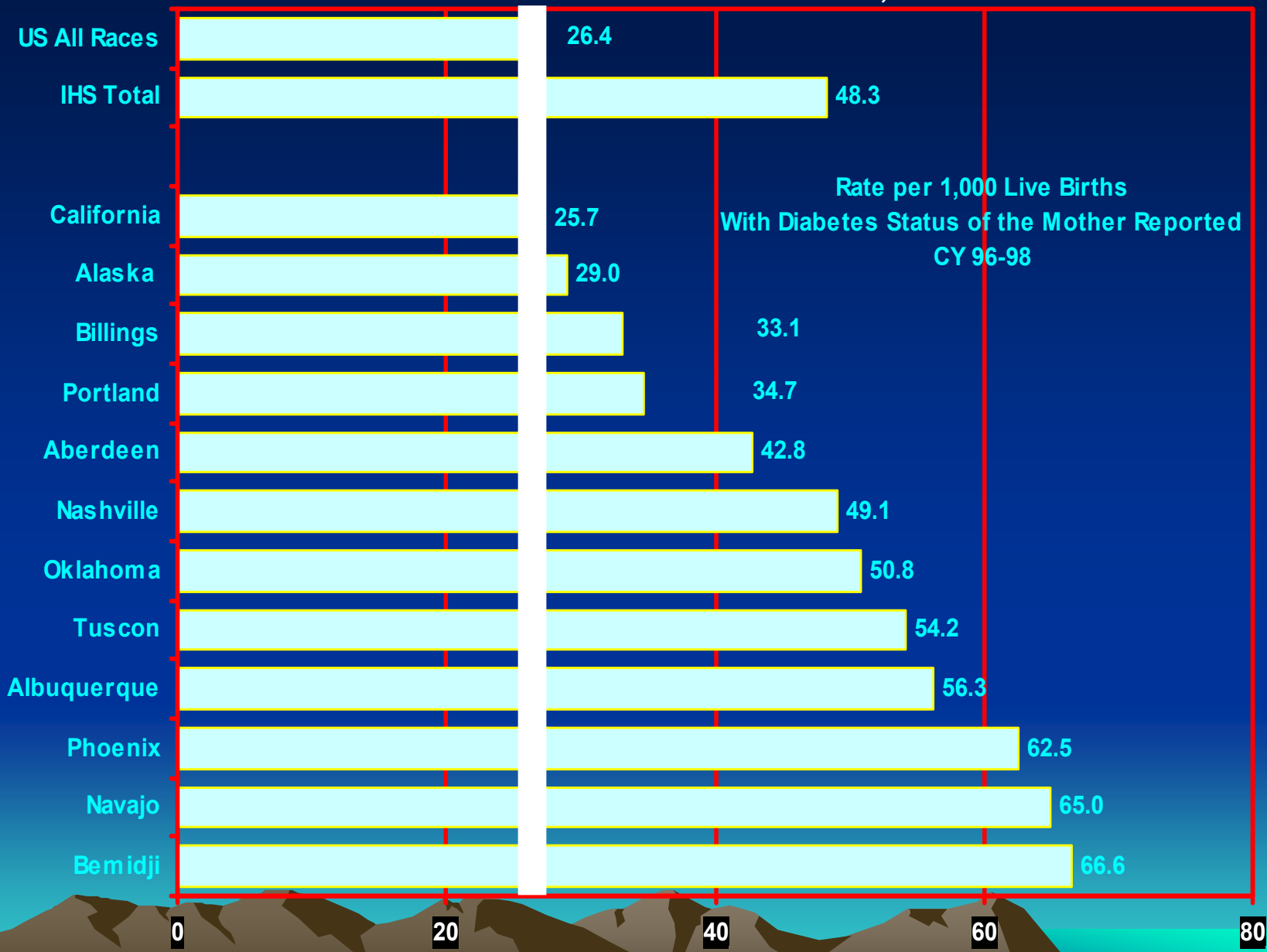
# ALASKA NATIVE MATERNAL-INFANT HEALTH STATUS

## High Weight Births, CY 96-98



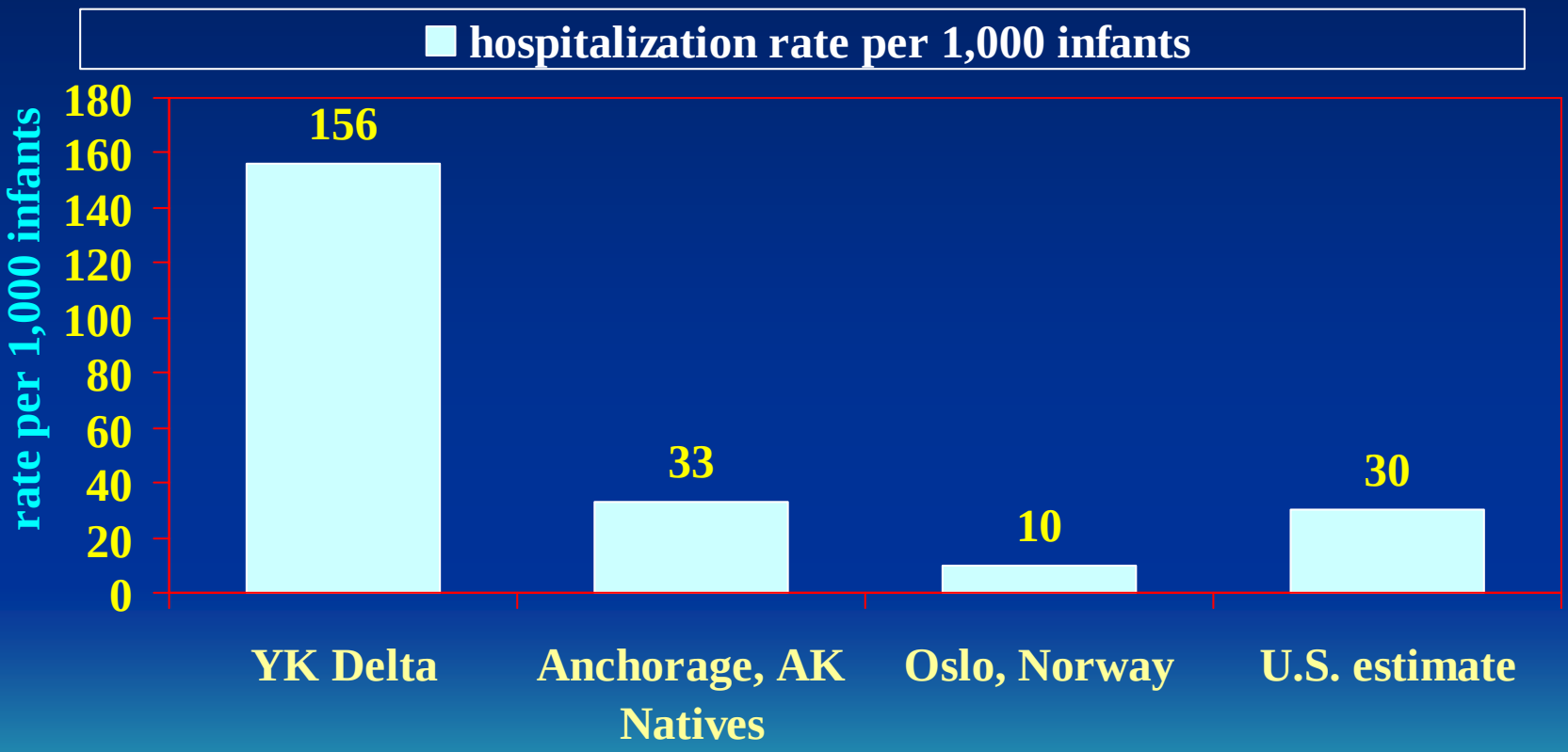
# ALASKA NATIVE MATERNAL-INFANT HEALTH STATUS

## Birth Rates with Diabetic Mother, CY 96-98



# RSV Infant Surveillance Study 1993-1996:

## YK Delta RSV hospitalization rate




*Karron R, Singleton R, Bulkow L et al. J Infect Dis. 1999;180:41-9*

# Alaska Native Traditional Food Safety Monitoring Program

## Methods

- Prospective cohort of maternal-infant pairs
  - Yukon-Kuskokwim Delta, Arctic Slope, Aleutian/Pribilof Islands
- Multi-year program
  - Started 1999
  - First cohort finished enrollment 2003
- 205 mothers
- 91 newborns
- Health records review of mothers and infants
- Statistical analysis in process

# Alaska Native Traditional Food Safety Monitoring Program

## Methods

- Enrolled at first prenatal visit
  - Dietary & demographics information
  - Blood & urine
- Umbilical cord blood at delivery
- Health outcomes
  - Maternal medical record (pregnancy complications and outcomes)
  - Infant medical record-1st year of life

# Alaska Native Traditional Food Safety Monitoring Program

## Methods

Laboratory Analysis

- National Center for Environmental Health, CDC (POPs, metals)
- Johns Hopkins University (Micronutrients)
- University of Alaska at Anchorage (Omega-3 fatty acids)

# Alaska Native Traditional Food Safety Monitoring Program

## Methods

Analytes

- Metals—lead, cadmium, mercury, arsenic
- POPs
  - Persistent pesticides, e.g., DDT
- PCBs

# Alaska Native Traditional Food Safety Monitoring Program

## Methods

Analytes

- Selenium
- Micronutrients
- Lipid content & omega-3 fatty acids
- Toxaphene, brominated flame retardants, perflourinated octane sulfonates (PFOS)

  (by pooled samples)

# Alaska Native Traditional Food Safety Monitoring Program

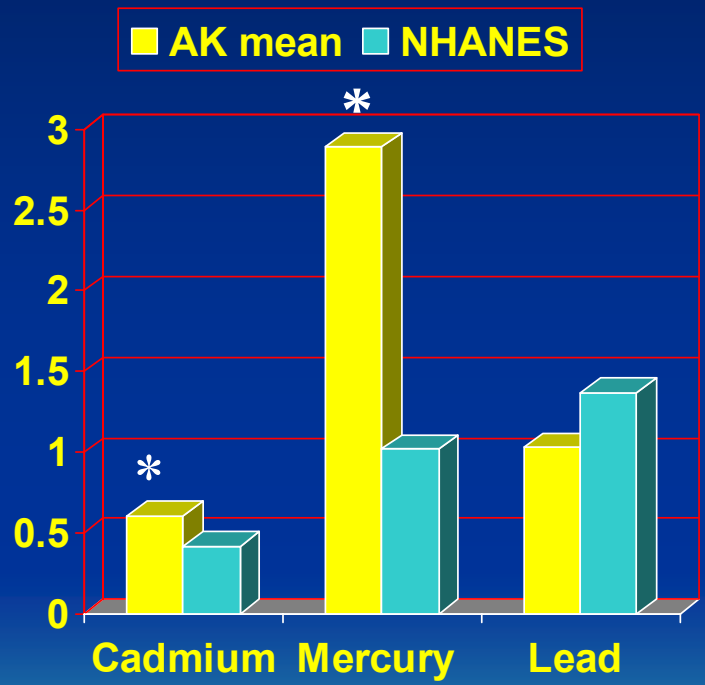
## Results

### Comparison of Alaska Native Pregnant Women & Women in NHANES

Blood Geometric Mean (N = 144)

Alaska versus NHANES

- **Cadmium (ppb)**
  **0.61 vs 0.42**
- **Mercury (ppb)**
  **2.89 vs 1.02***
- **Lead (ppb)**
  **1.03 vs 1.37**




*Adverse health outcomes at 58 ppb

•NHANES = 2nd National Report on Human Exposures to Environmental Chemicals
•Comparison Group: 16 – 49 year old females

# Alaska Native Traditional Food Safety Monitoring Program

## Blood Levels of Contaminants (micrograms/liters) in Circumpolar Women 1999 – 2003

| | Norway[3] | Canadian Inuit[3] | Greenland Inuit[3] (Nuuk) | Sweden[3] | Russian Fed. ARCH[3] Archangelsk | Russian Fed. Tamyr Peninsula[3] (Indigenous) | Iceland Pregnant Women[3] | Ak. Native Pregnant Women[4] | Faroe Islands[3] |
|---|---|---|---|---|---|---|---|---|---|
| Oxycl. | .04 | .30 | .17 | .02 | .18 | N/A | .04 | .09 | .12 |
| T-nona | .11 | .46 | .40 | .04 | .12 | .09 | .12 | .13 | .38 |
| DDT | N/A | .09 | .05 | .02 | .83 | .07 | .04 | .04 | .26 |
| DDE | .95 | 2.2 | 2.0 | .84 | 4.5 | 1.1 | .78 | .93 | 3.6 |
| HCB | N/A | .31 | .38 | .16 | .47 | 0.2 | .39 | .15 | .28 |
| Tox.[1] | .08 | | .27 | N/A | .11 | N/A | N/A | | .29 |
| ΣPCB[2] | 2.3 | 2.3 | 3.1 | 2.3 | 1.7 | N/A | N/A | 1.5 | 6.3 |

[1] – Toxaphene =sum of Parlar 26 + Parlar 50

[2] - ΣPCB = sum of CB28, CB52, CB99, CB101,CB105, CB118, CB128, CB138, CB153, CB156, CB170, CB180, CB183, CB187

[3] – AMAP Assessment 2002; Human Health in the Arctic, Chapter 5

[4] – Alaska Native Traditional Food Safety Monitoring Program 1999 – 2003 (J. Berner Pers. Comm.)

# Alaska Native Traditional Food Safety Monitoring Program

## Results

**P**BDE Levels in Humans (ppb lipid)

| Population | Mean |
|---|---|
| | |
| Alaska Native Women (pooled specimens) | 58.19 |
| Pregnant women Indiana | 41.1 |
| | |
| US Population | 35 |
| | |
| Europeans | 2 |

# Alaska Native Traditional Food Safety Monitoring Program

## Results

PFOS Levels in Humans (ppb serum)

| Population* | Mean | Range |
|---|---|---|
| Alaska Native Women | 34.2 | |
| Canadians | 28.8 | 3.7 - 65.1 |
| Japanese | | 2.8 – 28.1 |
| Japanese pregnant women | | 4.9 – 17.6 |
| Japanese Fetal samples | | 1.6 – 2.3 |

* Levels are highest in N. America, lowest in S. Asia.

# Alaska Native Traditional Food Safety Monitoring Program

## Results

Data Analysis

POPs, Metals and Micronutrients

- Correlation between health outcome (pregnancy outcome & rate of infectious disease during 1st year of life)
- Correlation of levels between mothers and infant (PFOS, PBFR, Toxaphene)
- Correlation of levels (POPs and micronutrients) with dietary history
- Regional comparisons

# Alaska Native Traditional Food Safety Monitoring Program

## Collaborators

- Alaska Native Tribal Health Consortium
- Yukon-Kuskokwim Health Corporation
- Arctic Slope Native Association
- Aleutian Pribilof Islands Association
- Environmental Protection Agency
- Centers for Disease Control and Prevention
  - National Center for Environmental Health
  - Arctic Investigations Program
- State of Alaska
- University of Alaska